DOCUMENT RESUME

ED 117 573 CE 006 010

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TITLE Algebra II. Mathematics Curriculum Guide (Secondary Vocational).
INSTITUTION Louisiana State Dept. of Education, Baton Rouge.
REPORT NO Bull-1283; VT-102-600
PUB DATE May 76
NOTE 77p.; For related documents, see CE 006 282-299

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage
DESCRIPTORS *Algebra; Behavioral Objectives; *Course Objectives; *Curriculum Guides; Learning Activities; Mathematical Applications; Mathematics Curriculum; *Secondary Education
IDENTIFIERS Louisiana

ABSTRACT

The curriculum guide for Algebra I correlates algebraic concepts with career-oriented concepts and activities. The curriculum outline format gives the concepts to be taught, material with related career-oriented performance objectives, concepts, and suggested instructional activities in facing page layouts. The suggested curriculum outline is compatible with all books on the approved textbook lists for Louisiana. The outline is divided into the following major headings: review of sets and the real number system; equations and inequalities; complex number system; relations, functions, and conic sections; exponential and logarithmic functions; sequence, series, and the binomial theorem; permutations, combinations, and probability; and introductory trigonometry. (MS)

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MATHEMATICS CURRICULUM GUIDE
CAREER ORIENTED
ALGEBRA II

Louisiana State Department of Education
Louis J. Watson, Superintendent
1979

BULLETIN NO. 1263

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RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
C. The field of real numbers	C. To demonstrate an understanding of the field properties, the student should be able to:
1. Closure property a. Addition b. Multiplication	1. Exemplify each of the closure properties.
2. Commutative property a. Addition b. Multiplication	2. Exemplify each of the commutative properties.
3. Associative property a. Addition b. Multiplication	3. Exemplify each of the associative properties.
4. Identity property a. Addition b. Multiplication	4. Exemplify each of the identity properties and name the additive identity and the multiplicative identity.
5. Inverse property a. Addition b. Multiplication	5. Exemplify each of the inverse properties and name the real number which does not have a multiplicative inverse.
6. Distributive property for multiplication over addition	6. Use the distributive property to: a. Express the sum of two numbers as the product of two numbers (e.g., $4+8=4(1+2)$). b. Express the product of two numbers as the sum of two numbers (e.g., $3(2+4)=6+12$).

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
C. Telephone field men constantly have to deal with trouble along the line. The real number properties properties as applied to formulas are important in this kind of work.	C. During a storm a defect occurred in a two-wire circuit joining points A and B which were 40 miles apart. One method of locating a defect of this kind is the Murray Loop Test, a diagram of which is shown below. The formula $\frac{x}{21-x} = \frac{R_1}{R_2}$ gives the relationship between the resistances R_1 and R_2, measured in ohms, and the distances 1 and x, when the resistances of the two wires joining A and B are equal. The distance from point A to the defect (represented by x in the formula) can be determined when R_1, R_2, and l, the distance from A to B) are known. In this case the engineer sent one of his men to make a cross of the wires at B. He connected a Wheatstone bridge to the two wires at A. He used 1000 ohms resistance for R_2 and adjusted the resistance R_1 to balance the bridge. The bridge balanced when R_1 was 181 ohms. By substituting known values in the formula given above, he obtained the equation $\frac{x}{(21-x)} = \frac{181}{1000}$. Solving for x, he found that the defect was 17.21 miles from A.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
D. Theorems	D. To further demonstrate understanding of the field properties, the student should be able to use the field properties to prove simple theorems.
E. Algebraic expressions	E. To demonstrate a basic knowledge concerning algebraic expressions, the student should be able to:
1. Definitions	1. Define variable, terms, like terms, coefficient, monomial, binomial, trinomial, and polynomial.
2. Addition	2. Add one expression to another
3. Subtraction	3. Subtract one expression from another.
4. Multiplication	4. Multiply one expression by another.
5. Division	5. Divide one expression by another.
6. Simplification	6. Simplify an expression by removing the symbols of grouping and combining like terms.
7. Evaluation	7. Evaluate an algebraic expression given replacement values for the variables.

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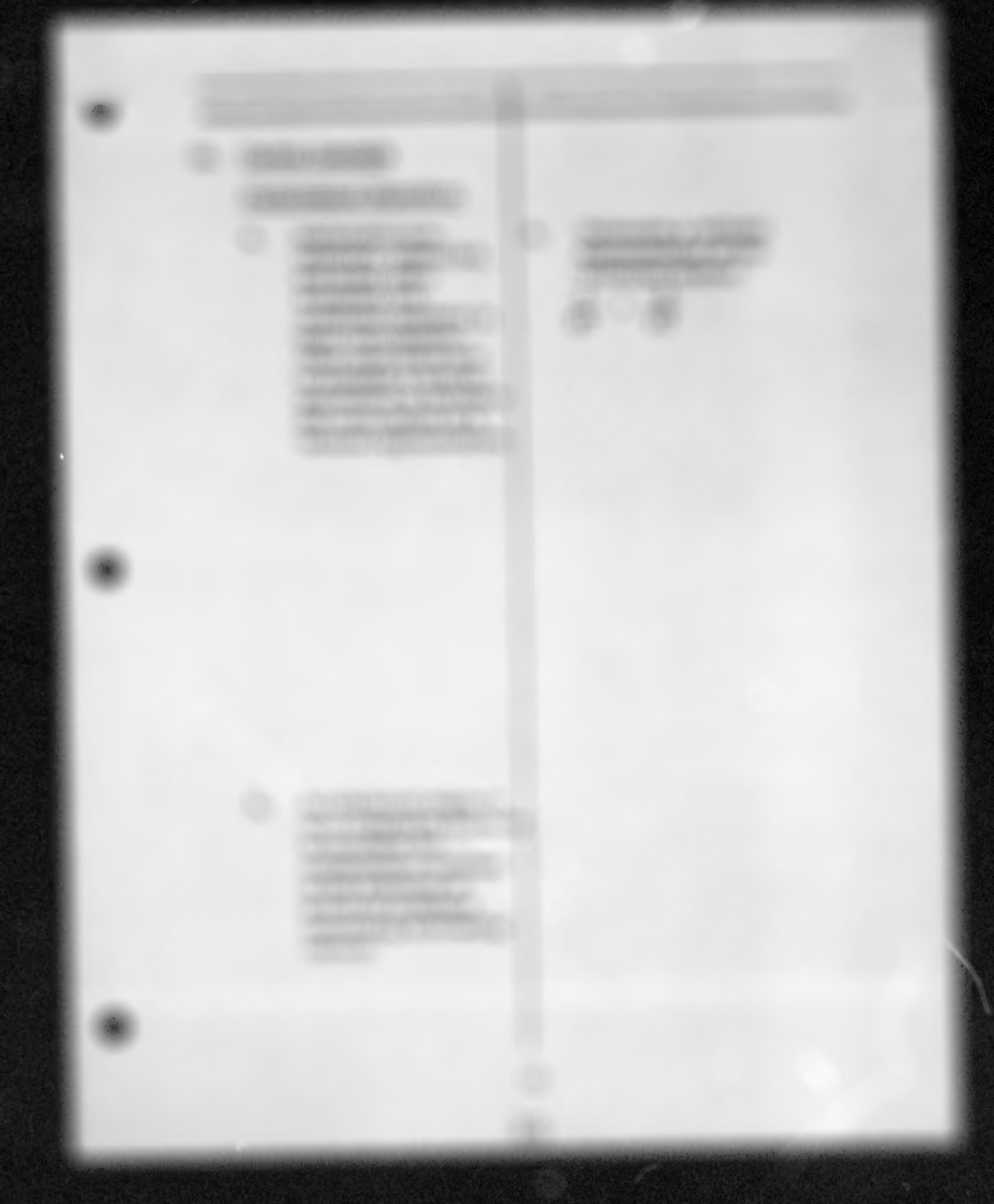
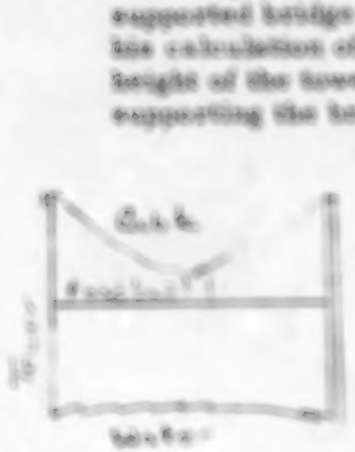
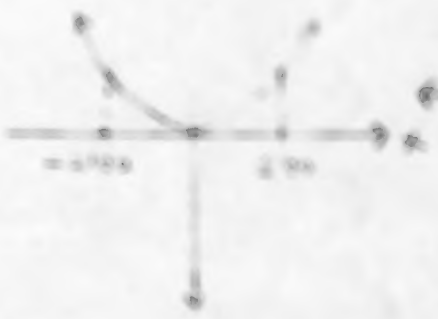


RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
D. Field of Complex numbers	D. To demonstrate that the complex number system is a field, the student should be able to illustrate (with an example) that each field property is satisfied.
E. Quadratic equations	E. To demonstrate a basic understanding of quadratic equations with complex roots, the student should be able to:
1. Discriminant	1. Determine the discriminant of a quadratic equation and use it to determine the nature of the roots.
2. Solution of quadratic equations	2. Compute the roots of a quadratic equation by: a. Completing the square b. Applying the quadratic formula
3. Root-coefficient relations	3. Determine the sum and product of the roots by the coefficients of the terms of the quadratic equation.
4. Determination from roots	4. Determine a quadratic equation given its roots.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
E. The civil engineer applies the relationship of a quadratic equation to the design of a cable supported bridge in the calculation of the height of the towers supporting the bridge.	E. In constructing a particular suspension bridge the ends of the two suspension cables are attached to the tops of the two supporting towers.  The curve of each cable is described by the quadratic equation $\frac{x^2}{800,000} = y$. The midpoint of the cable (low point) is 200 feet above the surface of the water, and the horizontal distance between the two towers is 8,000 feet. Determine the height of the towers above the surface of the water. Hint: Let the midpoint of the cable represent the vertex of a parabola with the equation $f(x) = \frac{x^2}{800,000} + 200$ (See sketch).  $f(2000) = f(-2000) = \frac{x^2}{800,000} + 200$ $(\frac{8}{2}, 2000)^2 = 800$, is the vertical distance from the low point of the cable to the top of the towers. Thus, 200 feet + 800 feet = 1000 feet is the height of each tower above the surface of the water.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
010. Extension	020. To extend the above concepts and skills, the student should be able to:
a. Proof of irrationality	a. Prove $\sqrt{2}$ is irrational.
b. Radical equations	b. Solve an equation which contains more than one radical.

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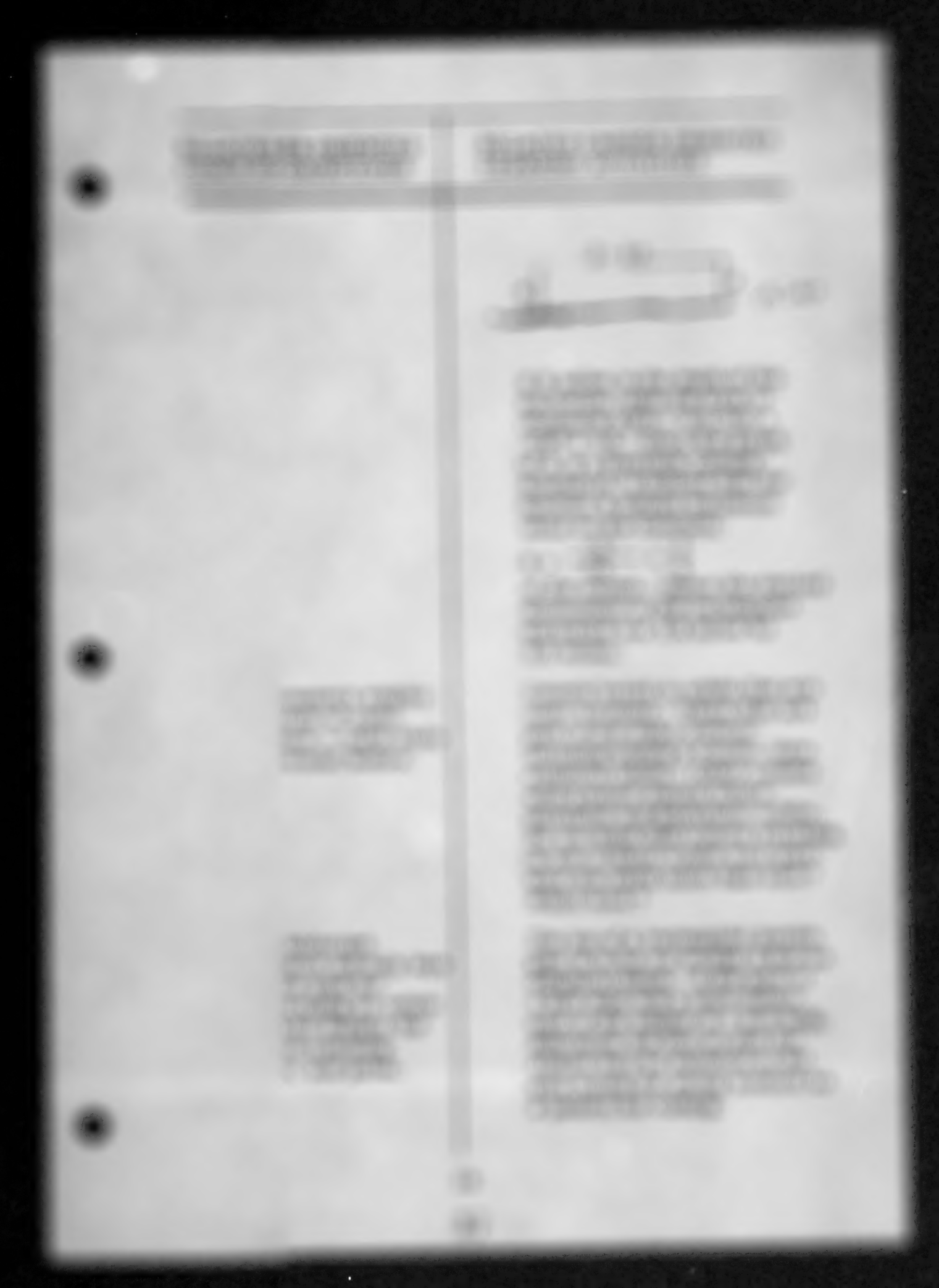

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
V. Exponential and Logarithmic Functions	**V. Exponential and Logarithmic Functions**
A. Exponential function	**A. To demonstrate a basic understanding of an exponential function the student should be able to:**
1. Definition	**1. Define an exponential function.**
2. Graph	**2. Graph an exponential function.**
B. Logarithm	**B. To demonstrate a basic understanding of logarithms, the student should be able to:**
1. Definition	**1. Define logarithm to the base b, $b > 0$ and $b \neq 1$.**
2. Laws	**2. Use the laws of logarithms and the definition of a logarithm to** **(a) Convert an equation to logarithmic form to an equation in exponential form.** **(b) Convert an equation in exponential form to an equation in logarithmic form.**
3. Function	**3. Define, state the domain, state the range, and sketch the graph of the logarithmic function.**

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
V. Career Concept Individuals adapt to world changes and environments. Performance Objectives	
A. A research technician often plots several sets of data on the same graph in order to compare data and to determine the most reliable solution.	A. Sketch the graphs of the exponential functions $f(x) = (1/2)^x$, $g(x) = 2^x$, and $h(x) = 2^{2x}$ on the same coordinate plane. Tell without sketching the graph of $j(x) = (1/3)^x$ which of the three previous graphs will be similar to the graph of j.
B. Banking personnel are frequently involved in working problems, the solution of which is not always found in tables. In dealing with interest formulae, logarithms can be applied.	B. If p dollars are invested in a savings account and interest is computed at the rate r, compounded m times per year, for n years, the amount, A, in the account will be $A = p(1 + \frac{r}{m})^{mn}$ if provision no withdrawals are made. Use logarithms to compute the amount for $1,000 invested for 15 years at 5% compounded monthly.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
5. Comparison of graphs	5. Explain how the graph of the exponential function and the graph of the logarithmic are related with respect to the line $y = x$.
6. Common	6. Determine the characteristic of the common log of a number, and use a table of common logarithms (with interpolation) to determine the mantissa of the logarithm.
7. Antilogarithm	7. Determine a number x when the common logarithm of x is given ($0 \leq x < 1$); compute the antilog of x).
8. Applications	8. Use the laws of logarithms and a table of common logs to (a) Compute the product of two numbers (b) Compute the quotient of two numbers (c) Determine the decimal representation of an exponential ($0 \leq x < 1$) given to a power or compute a root).
9. Equations	9. Solve a given logarithmic equation and use the theory of logarithms to solve equations of the type $a^{bx} = cx$).

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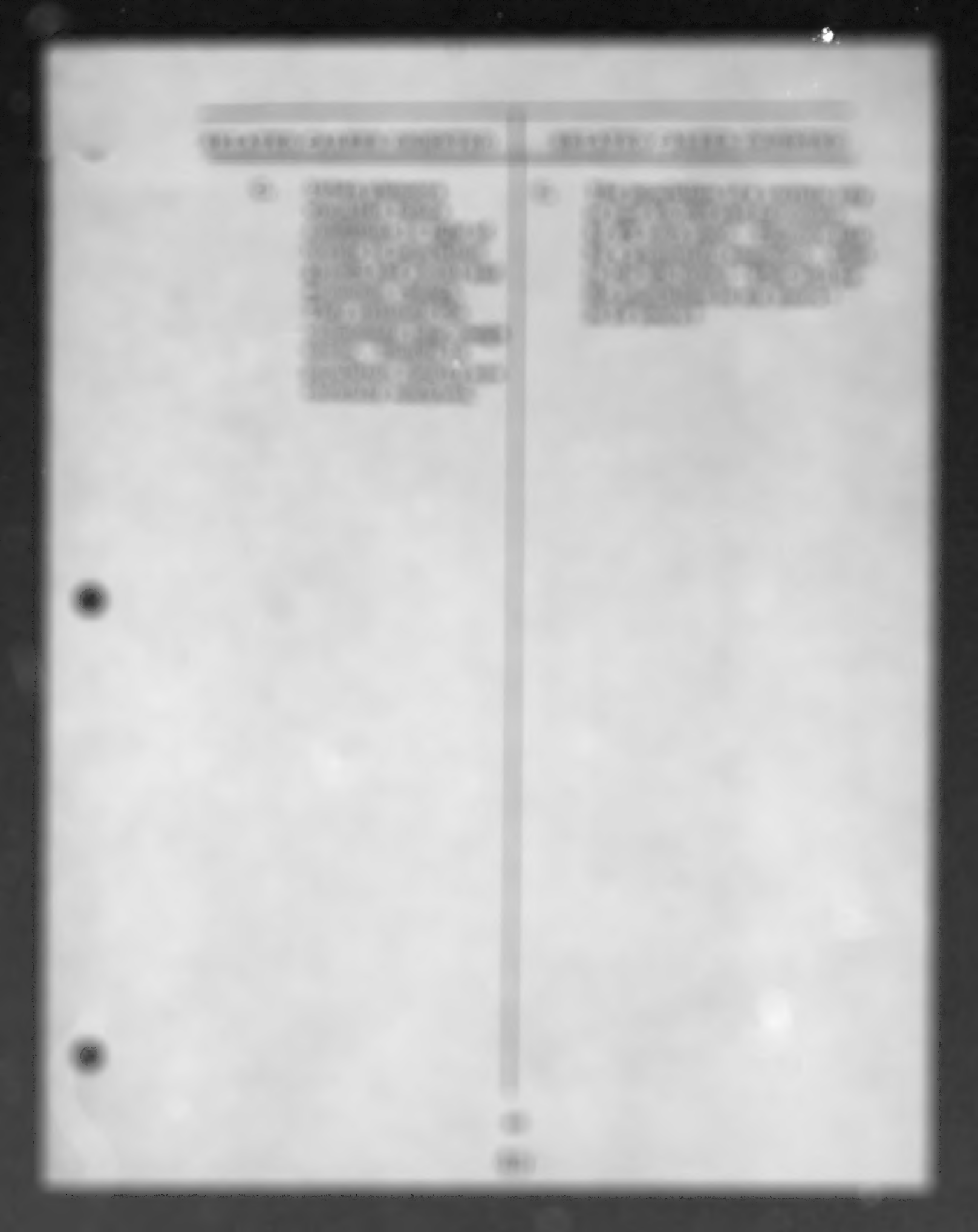

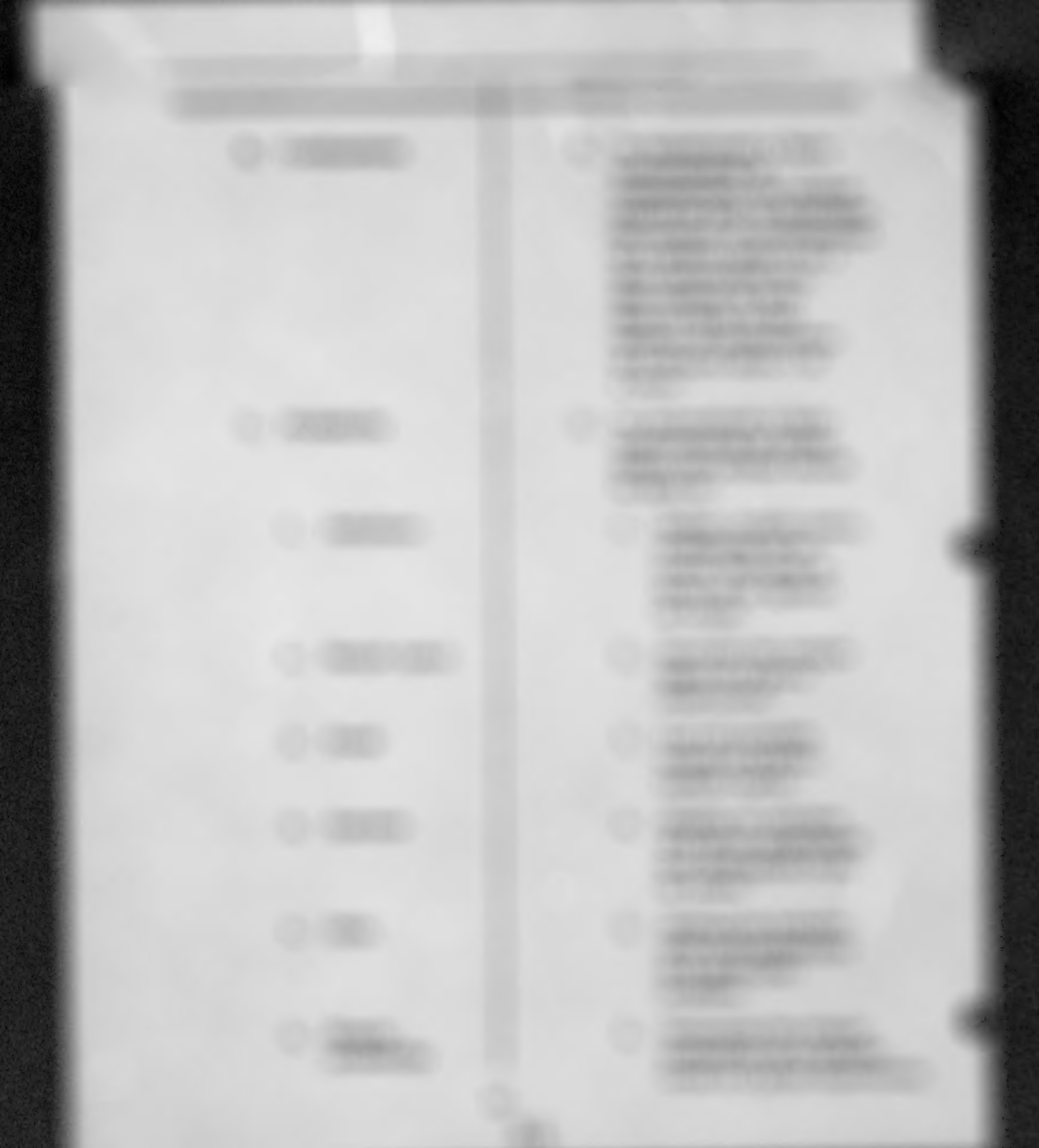

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
B. It can be helpful to a member of a civic organization to be able to determine possible combinations.	B. A committee with three members is to be appointed in a club with 20 members. In how many ways can this be done?
C. One of the supporting jobs in the statistical research department of a large manufacturer of prescription medicine is titled statistical analyst. The work of an analyst includes the development of simple statistical data.	C. Tossing a penny, which may fall heads up or heads down, is a random experiment. Estimate the probability of a heads up by tossing a penny 100 times. What is the sample space? To simplify the work, put 10 pennies in the box, shake, and examine for the number showing heads up. Do this 10 times. This will give a reasonable approximation to the problem of making 100 tosses with a single penny.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
VIII. Introductory Trigonometry	**VIII. Introductory Trigonometry**
A. Trigonometric functions	**A. To demonstrate a basic understanding of the trigonometric functions, the student should be able to:**
1. Definitions	**1. Define the six trigonometric functions.**
2. Trigonometric tables	**2. Use the tables of trigonometric functions to determine the value (or approximate value) of a function when given the angle measure, and to determine the angle measure (or approximate measure) when given the value of a function.**
3. Interpolation	**3. Use interpolation to obtain better approximation.**
B. Applications	**B. To demonstrate a basic understanding of the applications of trigonometry, the student should be able to use elementary trigonometry to solve selected physical problems; e.g., verbal problems.**

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
VIII. Career Concept Individuals may be suited for several different careers. Performance Objective	
D. It is sometimes convenient and helpful for a painter (or other construction personnel) to have a working knowledge of simple trigonometry.	D. A painter is assigned to a job which requires him to support a fire's ramp on a brick wall. The ramp on the wall is 21 feet above the ground and the painter is issued a 25 foot ladder to use. He has learned from experience that it is not safe to use a ladder that forms an angle with the ground greater than 65°. Should he consider the 25 foot ladder safe to use?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
[illegible] Sketching	[illegible] To extend the above concepts and skills the student should be able to:
a. Radian measure	a. Define radian measure of an angle, convert degree measure to radian measure, and convert radian measure to degree measure.
b. Identities	b. Verify selected trigonometric identities.
c. Graphs	c. Sketch the graphs of simple trigonometric functions.

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